

a pulse-width modulator, arranged for generating a pulse-width modulated version of an applied input image signal, based on the clock signal outputted by said clock generator; and

an image forming member, arranged to form an image based on the pulse-width modulated version of the applied input image signal, generated by said pulse-width modulator.

C3
amended

50. (Amended) A method for forming an image, comprising the steps of:
operating a clock generator that includes a plurality of serially-coupled flip-flops to sequentially output, from the clock generator, successive data collectively forming a clock signal having a non-uniform periodic time;
generating a pulse-width modulated version of an applied input image signal, based on the clock signal outputted by the clock generator; and
forming an image based on the pulse-width modulated version of the applied input image signal, generated in the generating step.

REMARKS

Claims 35-50 remain pending in this application. Claims 35 and 46-50 are independent claims. Claims 35 and 46-50 have been amended to even further clarify the claimed subject matter.

In the Office Action, Claims 35-50 were rejected under 35 U.S.C. § 103(a) as being obvious from European Patent Specification 0 421 712 B1 (Ojima et al.).

Applicant has carefully considered the arguments set forth in the Office Action in support of this rejection, but still strongly disagree with the rejection for the reasons given in the Remarks section on pages 8-13 of the Amendment After Final filed on October 29, 2001. That portion of the mentioned Amendment After Final is repeated and incorporated by reference herein.

Moreover, paragraph 4 of the Office Action states that “[c]ontrary to applicant’s arguments [in the Amendment After Final], the fact that Ojima has not gotten on these serially-connected flip-flops does not necessarily mean that it is not obvious, it merely means that he has not gotten a patent on this combination. The reason why might be, simply, because the combination is obvious.” However, Applicant submits that this reasoning is insufficient for establishing a *prima facie* case of obviousness against the claims. Indeed, to establish a *prima facie* case of obviousness, an examiner must establish that (1) there is some motivation or suggestion, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings, (2) there is a reasonable expectation of success, and (3) the prior art reference(s) teach or suggest all of the claim limitations at issue. MPEP § 2142. The above-quoted assertion from paragraph 4 of the Office Action does not appear to sufficiently establish any of these requirements, or have any significant relevance to them. To the contrary, even assuming *arguendo* that the assertion is relevant to any of the

requirements, the fact that Ojima may not have “gotten a patent” on “serially-connected flip-flops” would seem to support Applicant’s contention that the claimed invention would *not* have been obvious in view of Ojima et al. to one of ordinary skill in the art at the time of Applicant’s invention.

Furthermore, for the reasons given in the above-cited portion of the Amendment After Final filed on October 29, 2001, Applicant respectfully submits that the Examiner has failed to establish at least the above-mentioned first and third prongs of the test for establishing a *prima facie* case of obviousness. In view of this fact, and the fact that the present Office Action does not even mention Applicant’s arguments set forth on pages 10-12 of the Amendment After Final Rejection, let alone substantively address or rebut them, it is believed that the burden of establishing a *prima facie* case of obviousness against the claims still lies with the Examiner. *See* MPEP § 2142 (“The Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness.” . . . “When an applicant submits evidence . . . in reply to a rejection, the examiner must reconsider the patentability of the claimed invention. The decision on patentability must be made based upon consideration of all the evidence, including . . . evidence submitted by the applicant.”). Thus, Applicant respectfully requests that the Examiner substantively address the arguments set forth in the Amendment After Final filed on October 29, 2001, particularly the remarks appearing on page 12, lines 8-16 of that Amendment After Final.

Nonetheless, without conceding the propriety of the Section 103(a) rejection set forth in the Office Action, independent Claims 35 and 46-50 have been amended to even

further clarify that the clock signal has a non-uniform periodic time. For example, as now amended, independent Claim 35 is directed to an image forming apparatus comprising an image forming member adapted to form an image, and a pulse-width modulation means (e.g., modulation means 6) for generating a pulse-width modulation signal in accordance with an image signal. The pulse-width modulation means generates the pulse-width modulation signal by counting pulses of a first clock signal (e.g., clock signal PCLK) in accordance with the image signal, and the first clock signal is generated by reading data from a storage means which stores output pattern data of the first clock signal. The reading of data from the storage means is performed by outputting data corresponding to the pattern data from a plurality of flip-flops (e.g., 54a-0 to 54a-519) connected in series. The flip-flops latch the pattern data of the first clock signal, and, notably, the first clock signal has a non-uniform periodic time.

Independent Claims 46-48 are electron beam apparatus, modulation circuit, and method claims, respectively, which each recite features that correspond in many respects to those of independent Claim 35 discussed above.

Independent Claims 49 is directed to an image forming apparatus comprising a clock generator including a plurality of serially-coupled flip-flops that are operable as shift registers for sequentially outputting data forming a clock signal from the clock generator. The clock signal has a non-uniform periodic time. The apparatus also comprises a pulse-width modulator, arranged for generating a pulse-width modulated version of an applied input image signal, based on the clock signal outputted by the clock generator, and an

image forming member, arranged to form an image based on the pulse-width modulated version of the applied input image signal, generated by the pulse-width modulator.

Independent Claim 50 is a method claim corresponding to apparatus Claim 49.

As was described in the Amendment After Final filed on October 29, 2001, Ojima et al. refers to pulse-width modulating an eight bit input image signal into an output signal OPD whose minimum pulse width is $1/4$ the period of the input image signal VDO. A master clock CLK has a frequency which is the same as that of the input signal VDO, and switching clocks SCLK1 and SCLK2 having periods that are $1/2$ of the period of the master clock CLK are generated. Up/down counters 8 and 9 receive the switching clocks SCLK1 and SCLK2, respectively. The counters 8 and 9 are counted up or down in synchronization with the switching clocks SCLK1 and SCLK2, respectively, and outputs of the counters 8 and 9 are latched and then delivered to comparators 4 and 5, respectively. Input image data VDO is compared by the comparators 4 and 5, and the results are then forwarded to latches 13 and 14, respectively. Items of image data D1, D2 obtained from latches 13 and 14 enter a changeover circuit 15 where they are alternately selected in successive fashion based on the switching clocks SCLK1, SCLK2, and the successively selected items of data are outputted as serial output image data OPD. The circuit 15 includes a J-K flip-flop 17, AND gates 18, 19, and an OR gate 20. When signal SCLK2 rises, the image data D1 is outputted as the output image data OPD, and thus the serial image data OPD is delivered in an order

decided by the latching of latches 13 and 14. Referring to Fig. 4, the switching clocks are shown as being uniform over a time period.

In Applicant's view, while Ojima et al. may be well-suited for its intended purpose, nothing in that reference would teach or suggest generating a pulse-width modulation signal by counting pulses of a first clock signal having a non-uniform periodic time, in accordance with an image signal, as recited in Claims 35 and 46-48, or flip-flops which latch pattern data of the first clock signal having the non-uniform periodic time, as recited in those claims. Neither would anything in Ojima et al. teach or suggest generating a pulse-width modulated version of an applied input image signal, based on a clock signal having a non-uniform periodic time, as recited in Claims 49 and 50, or a clock generator including a plurality of serially-coupled flip-flops that are operable as shift registers for sequentially outputting data forming the clock signal, as recited in those claims.

For all of the foregoing reasons, Applicant respectfully submits that Claims 35 and 46-50 are clearly patentable over Ojima et al.

If the Examiner maintains the same Section 103(a) rejection in a next office action, then, in addition to addressing the above-mentioned arguments set forth in the Amendment After Final, the Examiner is respectfully requested to point out which portion of Ojima et al. he believes teaches a clock signal having a non-uniform periodic time, as used in the context of the invention recited in the independent claims herein.

A review of the other art of record has failed to reveal anything which, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as a

reference against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from independent Claim 38, discussed above, and are therefore believed patentable for the same reasons as is Claim 38. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of each on its own merits is respectfully requested.

Applicant respectfully requests favorable consideration and early allowance of the present application.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

35. (Amended) An image forming apparatus comprising:
an image forming member adapted to form an image; and
pulse-width modulation means for generating a pulse-width modulation
signal in accordance with an image signal,
wherein said pulse-width modulation means generates the pulse-width
modulation signal by counting pulses of a first clock signal in accordance with the image
signal, and
wherein the first clock signal is generated by reading data from storage
means which stores output pattern data of the first clock signal, and the reading of data
from said storage means is performed by outputting data corresponding to the pattern data
from a plurality of flip-flops connected in series, the flip-flops latching the pattern data of
the first clock signal, and wherein the first clock signal has a non-uniform periodic time.

46. (Amended) An electron beam apparatus comprising:
an electron beam source; and
pulse-width modulation means for generating a pulse-width modulation
signal to control electron emission,

wherein said pulse-width modulation means generates the pulse-width modulation signal by counting pulses of a first clock signal in accordance with an input signal, and

wherein the first clock signal is generated by reading output pattern data from storage means which stores the output pattern data of the first clock signal, and the reading of the output pattern data from said storage means is performed by outputting data corresponding to the pattern data from a plurality of flip-flops connected in series, the flip-flops latching the pattern data of the first clock signal, and wherein the first clock signal has a non-uniform periodic time.

47. (Amended) A modulation circuit comprising:

a pulse-width modulation circuit generating a pulse-width modulation signal;

and

a plurality of flip-flops connected in series,

wherein said pulse-width modulation signal is generated by counting pulses of a first clock signal in accordance with an input signal, and

wherein the first clock signal is generated by reading output pattern data from storage means which stores the output pattern data of the first clock signal, and the reading of the output pattern data from the storage means is performed by outputting data corresponding to the pattern data from said plurality of flip-flops, the flip-flops latching the

pattern data of the first clock signal, and wherein the first clock signal has a non-uniform periodic time.

48. (Amended) A method for driving an image forming apparatus comprising an image forming member which forms an image and pulse-width modulation means for generating a pulse-width modulation signal in accordance with an image signal, said method comprising the step of:

generating the pulse-width modulation signal by counting pulses of a first clock signal in accordance with the image signal, wherein the first clock signal is generated by reading output pattern data from storage means which stores the output pattern data of the first clock signal, and the reading of the output pattern data from the storage means is performed by outputting data corresponding to the pattern data from a plurality of flip-flops connected in series, the flip-flops latching the pattern data of the first clock signal, and wherein the first clock signal has a non-uniform periodic time.

49. (Amended) An image forming apparatus comprising:

a clock generator including a plurality of serially-coupled flip-flops that are operable as shift registers for sequentially outputting data forming a clock signal from said clock generator, the clock signal having a non-uniform periodic time;

a pulse-width modulator, arranged for generating a pulse-width modulated version of an applied input image signal, based on the clock signal outputted by said clock generator; and

an image forming member, arranged to form an image based on the pulse-width modulated version of the applied input image signal, generated by said pulse-width modulator.

50. (Amended) A method for forming an image, comprising the steps of:

operating a clock generator that includes a plurality of serially-coupled flip-flops to sequentially output, from the clock generator, successive data collectively forming a clock signal having a non-uniform periodic time;

generating a pulse-width modulated version of an applied input image signal, based on the clock signal outputted by the clock generator; and

forming an image based on the pulse-width modulated version of the applied input image signal, generated in the generating step.